United States Steel Corporation
Mon Valley Complex - Clairton Plant
Clairton, Pennsylvania

Relative Accuracy Test Audit of the Continuous Emissions Monitoring Systems at U.S. Steel Mon Valley Complex – Clairton Plant – Boiler No. 1 and Boiler No. 2 – per Pennsylvania Department of Environmental Protection – Continuous Source Monitoring Manual and Code of Federal Regulations, Title 40, Part 75 (Continuous Emission Monitoring) Requirements – March 18, 2009 and March 19, 2009

April 2009

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Project No.: 09-6296-ENV, Task 102

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

CERTIFICATION

The following certification has been prepared in accordance with the requirements of the Pennsylvania Department of Environmental Protection (PA DEP) Source Testing Manual (Revision 3.3, November 2000), Section 2.1.2.6:

To the best of my knowledge, this source test report has been checked for completeness and the results presented herein are accurate, error-free, legible and representative of the actual emissions measured during the testing.

April 8, 2009

Hudson Tiffany
Sr. Field Technician

Date

EXECUTIVE SUMMARY

A relative accuracy test audit (RATA) of the continuous emissions monitoring systems (CEMS) was conducted at the 2 boilers located at the U.S. Steel Clairton Plant Utilities Powerhouse. The CEMS for Boilers No. 1 and No. 2 were tested on March 18 and 19, 2009, respectively. Both boilers passed the NO_x CEMS RATA criteria stipulated by the PA DEP and U.S. EPA regulations.

The results also showed that the NO_x CEMS satisfied the criteria to allow the RATA frequency to remain on an annual basis. The results showed that no bias adjustment is required for the Utilites Powerhouse boilers' NO_x emissions factors reported by the U.S. Steel CEMS.

1.0 INTRODUCTION

1.1 Summary of the Test Program

United States Steel Corporation - Mon Valley Complex (U.S. Steel) operates two boilers at its Clairton Plant located in Clairton, Pennsylvania. The boilers, which are identified as Units No. 1 and No. 2, within the Utilities Powerhouse, are used to produce steam that is used throughout the plant. Each boiler is fired using coke oven gas (COG) that is supplemented with a small amount (normally between 0 and 10 percent by volume) of natural gas. Air emissions from each boiler are exhausted to the atmosphere through a single exhaust stack. Concentrations of nitrogen oxides (NO_x) and oxygen (O_2) in each boiler flue gas stream are monitored and recorded on a continuous basis using a continuous emissions monitoring system (CEMS). Each CEMS consists of a NO_x analyzer, an O_2 analyzer and a data acquisition system. Oxygen concentrations are measured in units of percent by volume, dry basis (%). Nitrogen oxide emissions are reported in units of pounds per million British Thermal Units of heat input (lb/MMBtu). NO_x emissions in units of lb/MMBtu are calculated from the knowledge of the NO_x concentration in the flue gas stream, the oxygen concentration in the flue gas stream and the F-factor of the composite fuel. The F-factor is defined as the ratio of the volume of combustion gas products produced to the thermal input of the fuel gas. The composite F-factor is calculated from the knowledge of the composition and usage of each fuel gas. The boiler fuel gas composition is monitored and recorded on a continuous basis by U.S. Steel using gas chromatographic techniques.

A relative accuracy test audit (RATA) of the two U.S. Steel CEMS was conducted to satisfy the requirements promulgated in the Pennsylvania Department of Environmental Protection (PA

DEP) Continuous Source Monitoring Manual (Revision No. 8, December 2006) and the Code of Federal Regulations (CFR), Title 40, Part 75 (Continuous Emission Monitoring). In summary, the RATA consisted of nine 21-minute comparison test runs at each boiler. For each test run, the concentrations of NO_x and O_2 in the applicable boiler flue gas stream were measured. Nine test runs at each boiler were examined and a series of statistical measures were generated to determine if the CEMS passed the RATA. Each RATA was performed while the boiler was operating at a typical steam production rate. Chester Engineers, Inc. (Chester) was contracted by U.S. Steel (host site) to conduct the RATA.

1.2 Key Personnel

Contact information for the key personnel who coordinated the test program is listed below:

NAME AND TITLE	AFFILIATION AND MAILING ADDRESS	ASSIGNMENT	TELEPHONE NO. & E-MAIL ADDRESS
Coleen M. Davis - Senior Environmental Engineer	United States Steel Corporation Mon Valley Complex Clairton Plant 400 State Street Clairton, PA 15025	Facility Owner / Operator Representative	(412) 233-1015 cdavis@uss.com
Gary S. Swaoger – Research Analyst	United States Steel Corporation Mon Valley Complex Clairton Plant 400 State Street Clairton, PA 15025	Facility Owner / Operator Representative	(412) 233-1423 gswaoger@ uss.com
Daniel A. Nadzam, P.E. Engineer II	Chester Engineers 260 Airside Drive Moon Township, PA 15108	Air Emissions Testing Representative	(412) 809-6600 dnadzam@ chester-engineers.com
Bernie A. Clark Project Manager	Veolia Water North America Operating Services, LLC c/o U.S. Steel Corporation Mon Valley Complex Clairton Plant 400 State Street Clairton, PA 15025	Chester's Subcontractor Representative	(412) 233-1050 bernard.clark@ veoliawaterna. com bclark@uss.com

The PA DEP did not send an observer to witness the field testing procedures, but Mr. Phil Lawrence of the ACHD witnessed the field testing procedures on March 18 and 19, 2009. The PA DEP has assigned Environmental Laboratory Registration No. 02-1193 to Chester.

2.0 SUMMARY OF THE TEST RESULTS

2.1 RATA Nomenclature

The PA DEP and 40 CFR 75 RATA nomenclature is defined as follows:

- RA – 1 = Relative Accuracy – Criterion No. 1
- RA – 3 = Relative Accuracy – Criterion No. 3
- RA – 4 = Relative Accuracy – Criterion No. 4
- RM = Reference Method – data generated by Chester
- d = Average difference between the RM emissions and the U.S. Steel emissions as calculated from the nine comparison test runs
- Abs (d) = Absolute value of d
- CC = Confidence coefficient = 2.306 * Sd / ($9^{0.5}$) (for nine comparison test runs)
- Sd = Sample standard deviation of the sample set consisting of the differences between the RM emissions and the U.S. Steel emissions as calculated from the nine comparison test runs
- Abs (CC) = Absolute value of CC
- ARM = Average RM value [NOx emissions factor (lb/MMBtu) or O_2 concentration (%)] as calculated from the nine comparison test runs
- Average Absolute Arithmetic Difference = Value obtained by first computing the absolute differences between the RM emissions factors or concentrations and the U.S. Steel emissions factors or concentrations from the nine comparison test runs and then computing the average of the nine absolute differences

2.2 PA DEP RATA Criteria

NO_x Monitors:

For NO_x, one of the following two criteria must be satisfied:

- RA – 1 = {Abs (d) + Abs (CC)} / ARM <= 20%; or
- RA – 4 = Average Absolute Arithmetic Difference <= 0.02 lb/MMBtu

RATA Frequency:

The PA DEP regulations specify that RATAs need to be conducted at least once per year and no less than six months after the previous RATA.

2.3 40 CFR 75 RATA Criteria

NO_x Monitors:

For NO_x, one of the following two criteria must be satisfied:

- RA – 1 = {Abs (d) + Abs (CC)} / ARM <= 10%; or
- RA – 4 = Average Absolute Arithmetic Difference <= 0.02 lb/MMBtu
  (RA – 4 only applicable if actual U.S. Steel NO_x emissions < = 0.200 lb/MMBtu)

RATA Frequency:

The 40 CFR 75 regulations specify that the RATAs need to be conducted semiannually. However, the RATAs may be conducted on an annual basis if the following criteria are satisfied during the most recent RATA:

For NO_x, one of the following two criteria must be satisfied:

- RA – 1 = {Abs (d) + Abs (CC)} / ARM <= 7.5%; or
- RA – 4 = Average Absolute Arithmetic Difference <= 0.015 lb/MMBtu
  (RA – 4 only applicable if NO_x emissions < = 0.200 lb/MMBtu)

Bias Adjustment Factor:

The 40 CFR 75 regulations also specify that the NO_x emissions factor (lb/MMBtu) reported by the U.S. Steel CEMS may need to be adjusted based on the results of the RATA. If required, the adjustments are calculated using the Bias Adjustment Factor (BAF) as shown in the following equations:

- BAF = 1 + {Abs (d) / Average U.S. Steel CEMS NOx emissions factor}
- NOx emissions factor (adjusted) = NOx emissions factor (initial) * BAF

However, the 40 CFR 75 regulations state that no NO_x emissions factor adjustment is required (i.e., BAF = 1) if the following criterion is satisfied during the most recent RATA:

- d <= Abs (CC)

2.4 Boiler No. 1

The Boiler No. 1 RATA was conducted on March 18, 2009. The NO_x CEMS Part 75 RATA results for Boiler No. 1 have been summarized in Table 1. The NO_x CEMS RATA results passed both the PA DEP and 40 CFR 75 criteria. The results also showed that the NO_x CEMS satisfied the criteria to allow the RATA frequency to remain on an annual basis. The results showed that no bias adjustment is required for the NO_x emissions factors reported by the U.S. Steel CEMS.

2.5 Boiler No. 2

The Boiler No. 2 RATA was conducted on March 19, 2009. The NO_x CEMS Part 75 RATA results for Boiler No. 2 have been summarized in Table 2. The NO_x CEMS RATA results passed both the PA DEP and 40 CFR 75 criteria. The results also showed that the NO_x CEMS satisfied the criteria to allow the RATA frequency to remain on an annual basis. The results showed that no bias adjustment is required for the NO_x emissions factors reported by the U.S. Steel CEMS.

3.0 TEST METHODOLOGIES

3.1 U.S. Steel CEMS

Detailed information pertaining to the U.S. Steel CEMS was submitted in their Phase I application to the PA DEP in 1994 and also in the 40 CFR 75 Monitoring Plan that was submitted to the PA DEP and the U.S. EPA in 2002. For the RATA, U.S. Steel provided one-minute and the applicable 21-minute averages of their CEMS data to Chester. Copies of the applicable U.S. Steel CEMS data for Boiler No. 1 and Boiler No. 2 can be found in Appendix A. The RATA was performed while each boiler was operating at a typical steam production rate. A comparison time check showed that the U.S. Steel data acquisition system clock was 62 minutes slower than Chester's clock (Chester - 62 minutes = U.S. Steel).

3.2 Reference Methods Used by Chester

The RATA was conducted in accordance with the pre-test procedural protocol submitted to the PA DEP in January 2009 entitled "Pre-Test Procedural Protocol for the Relative Accuracy Test Audit of the Continuous Emissions Monitoring Systems at United States Steel Corporation - Mon Valley Complex – Clairton Plant – Boiler No. 1 and Boiler No. 2 – per Pennsylvania Department of Environmental Protection - Continuous Source Monitoring Manual and Code of Federal Regulations, Title 40, Part 75 (Continuous Emission Monitoring) Requirements – January 2009." Copies of correspondence between the PA DEP and U.S. Steel can be found in Appendix A.

The following U.S. EPA reference test methodologies were used by Chester to conduct the RATA:

Reference Code of Federal Regulations, Title 40, Part 60, Appendix A -

Method 3A – Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources (Instrumental Analyzer Procedure)
Method 7E – Determination of nitrogen oxides emissions from stationary sources (Instrumental Analyzer Procedure)

Reference Code of Federal Regulations, Title 40, Part 60, Appendix B -

Performance Specification 2 – Specifications and test procedures for SO_2 and NO_x continuous emissions monitoring systems in stationary sources
Performance Specification 3 – Specifications and test procedures for O_2 and CO_2 continuous emissions monitoring systems in stationary sources

Details of the reference methods used by Chester are presented in the following sections.

3.2.1 Location of Traverse Points

A stratification test was conducted prior to the start of the RATA at each boiler to determine the number and location of the sampling points. The stratification test was conducted in accordance with the requirements promulgated in 40 CFR 75 Appendix A, Section 6.5.6. The stratification test was conducted under the most steady-state conditions possible so as not to measure process related concentration variations.

The schematic of Boiler No. 1 exhaust stack, test ports and sampling points is presented in Figure 1. The schematic for Boiler No. 2 exhaust stack, test ports and sampling points is presented in Figure 2. At each stack, NO_x concentration was measured for two consecutive minutes at each of twelve traverse points (as shown in Figures 1 and 2) located through a single test port. The average NO_x concentration at each traverse point was calculated. The average NO_x concentration for all twelve traverse points was also calculated (identified as $(NO_x)_{avg}$). The number and location of the sampling points for the RATA was determined based on results of each stratification test as outlined below:

PARAMETERS	CRITERIA AT ALL TRAVERSE POINTS	NUMBER AND LOCATION OF SAMPLING POINTS
NO_x	The average traverse point NO_x concentration is +/- 5% or +/- 3ppmv of $(NO_x)_{avg}$	1 Sampling Point located at least 1 meter from the stack wall (21 minutes of sampling per point per test run)
NO_x	The average traverse point NO_x concentration is +/- 10% or +/- 5ppmv of $(NO_x)_{avg}$	3 Sampling Points located 4.4%, 14.6% and 29.6% of the way across the stack (7 minutes of sampling per point per test run)
NO_x	All other conditions	6 Sampling Points located in accordance with U.S. EPA Reference Method 1 (3.5 minutes of sampling per point per test run)

Results of the stratification tests can be found in Appendix B. The stratification test results for the Chester data at Boiler Nos. 1 and 2 indicated the need to perform the RATA using a single sampling point.

3.2.2 Oxygen Concentration

Oxygen concentrations were measured on a dry basis (units of percent by volume, %) using CEM techniques in accordance with U.S. EPA Reference Method 3A. Measurements were conducted by means of a gas extraction and conditioning system. Conditioning of the sample gas was accomplished by pulling it from the stack through a stainless steel probe and in-stack glass fiber filter. The filtered gas was routed through a 300-foot length of heated Teflon line to Chester's mobile CEM laboratory located nearby. The heated line temperature was maintained at 248 +/- 25^0F to prevent condensation from occurring in the sample line. A portion of the gas stream was split from the main sample gas stream in the CEM laboratory and treated to remove moisture by a non-contact refrigerative method such that the dew point of the treated sample gas was 40^0F or

lower. The dry sample was then manifolded and routed to a Model 100P California Analytical Instruments, Inc. Paramagnetic Oxygen Analyzer, operating on a range of 0 to 25 percent, by volume, dry basis. Sample gas flow not delivered to the analyzer was sufficient to allow a bypass stream that minimized sample residence time.

Data recording was accomplished with the use of a computer based, automated digital data acquisition system. Oxygen concentrations were scanned at five-second intervals. The scanned values were averaged every minute, displayed on a system monitor and recorded on magnetic storage media. Chester reference method comparison data can be found in Appendix B.

A three-point calibration of the oxygen analyzer was conducted at the beginning of each test day using U.S. EPA Protocol No. 1 gas standards. A sampling system bias check was conducted immediately before and after each RATA test run using the zero and mid-point calibration gas standards. The average oxygen concentration measured during each RATA test run was corrected for the analyzer and bias drifts in accordance with U.S. EPA Reference Method 3A. For the bias checks, the calibration gases were introduced through a three-way valve that was installed immediately downstream of the in-stack filter holder.

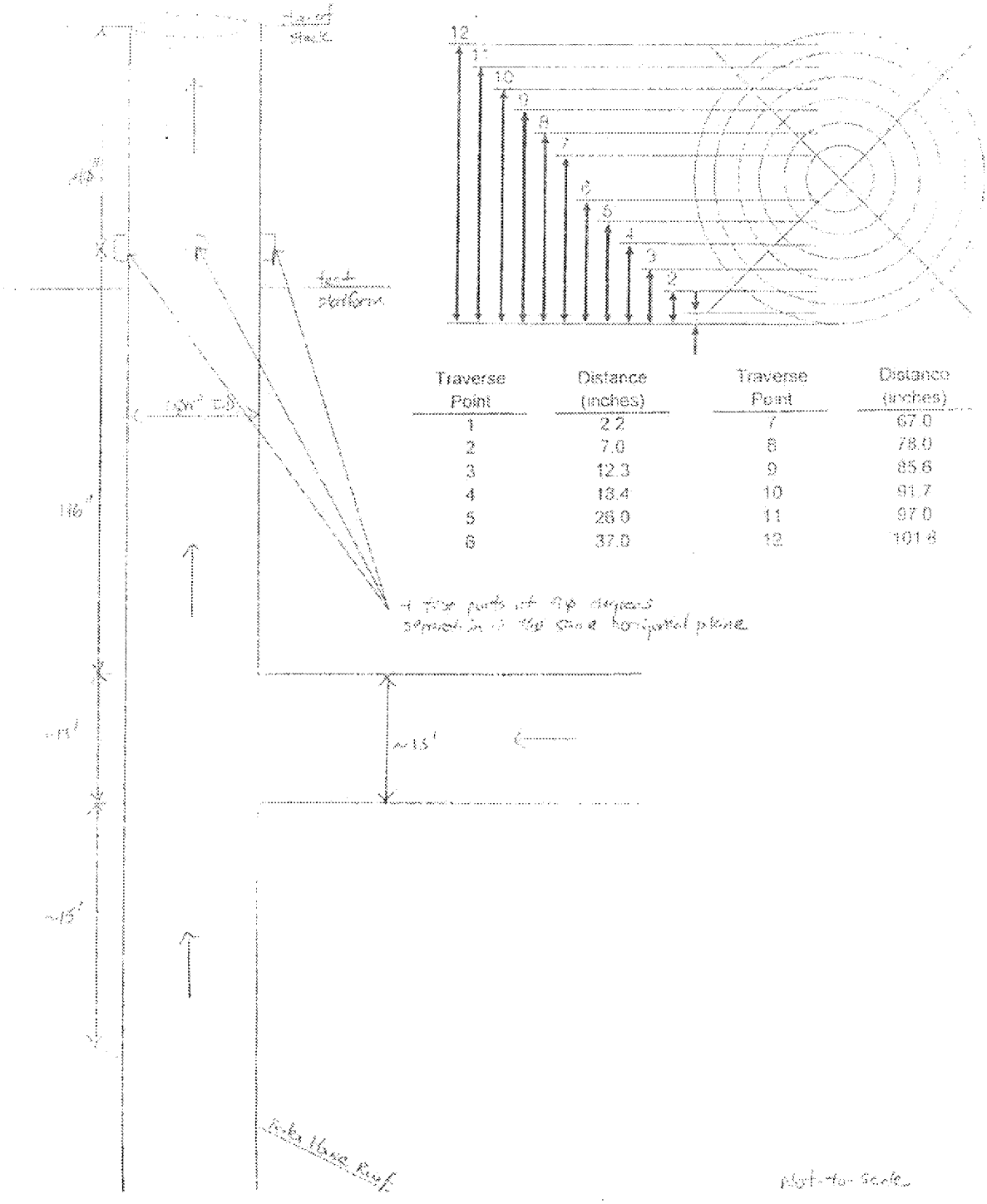
3.2.3 Nitrogen Oxide Emissions

Nitrogen oxide concentrations were measured on a dry basis (units of parts per million by volume, ppmv) using CEM techniques in accordance with U.S. EPA Reference Method 7E. The gas extraction and conditioning system, data recording mechanism and calibration procedures were the same as described in Section 3.2.2. A Model 200AH Advanced Pollution Instrumentation, Inc. Chemiluminescent NO_x Analyzer, operating on a range of 0 to 500 ppmv, was used. NO_x emissions in units of lb/MMBtu were calculated using the following formula:

NO_x emissions (lb/MMBtu) =
NO_x concentration (ppmv) * Fd * 1.194 * 10^{-7} * 20.9 / {20.9 – O_2 concentration (%)}

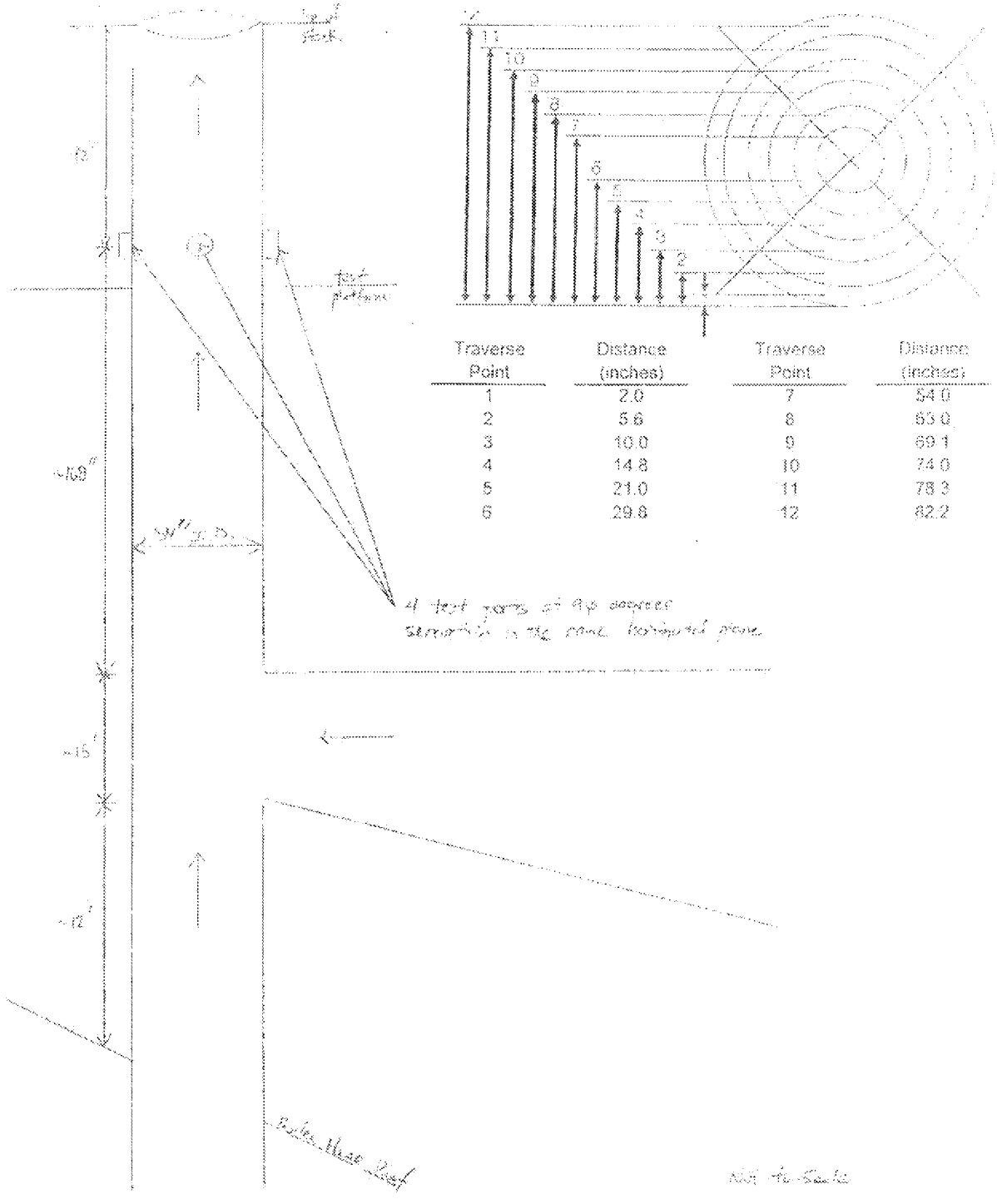
U.S. Steel provided the average composite Fd factor for each 21-minute test run. The results of the NO_x analyzer interference response test and the NO_2 to NO conversion efficiency test conducted on March 11, 2009 can be found in Appendix B.

U.S. Steel Corporation - Mon Valley Complex
Clairton Plant - Clairton, PA
Figure 1
Schematic of Boiler No. 1
Exhaust Stack, Test Ports and Sampling Points



Traverse Point	Distance (inches)	Traverse Point	Distance (inches)
1	2.2	7	67.0
2	7.0	8	78.0
3	12.3	9	85.6
4	18.4	10	91.7
5	26.0	11	97.0
6	37.0	12	101.8

U.S. Steel Corporation - Mon Valley Complex
Clairton Plant - Clairton, PA
Figure 2
Schematic of Boiler No. 2
Exhaust Stack, Test Ports and Sampling Points



Traverse Point	Distance (inches)	Traverse Point	Distance (inches)
1	2.0	7	54.0
2	5.6	8	63.0
3	10.0	9	69.1
4	14.8	10	74.0
5	21.0	11	78.3
6	29.8	12	82.2

U.S. STEEL CORPORATION - MON VALLEY COMPLEX
CLAIRTON PLANT - UTILITIES POWERHOUSE
CLAIRTON, PENNSYLVANIA

TABLE I

BOILER NO. 1
NOx CEM PART 75 RATA RESULTS
MARCH 18, 2009

All Test Runs

Test Run No.	Test Date	Start Time (EDT)	Stop Time (EDT)	RM Test Run Avg. NOx (lb/MMBtu)	USS CEM Test Run Avg. NOx (lb/MMBtu)	Arithmetic Difference (lb/MMBtu)	
1	3/18/2009	9:07	9:27	0.234	0.241	-0.007	<<<
2	3/18/2009	9:40	10:00	0.237	0.243	-0.006	<<<
3	3/18/2009	10:16	10:36	0.237	0.242	-0.005	<<<
4	3/18/2009	10:51	11:11	0.235	0.239	-0.004	<<<
5	3/18/2009	11:23	11:43	0.240	0.244	-0.004	<<<
6	3/18/2009	11:55	12:15	0.242	0.245	-0.003	<<<
7	3/18/2009	12:25	12:45	0.242	0.244	-0.002	<<<
8	3/18/2009	12:56	13:16	0.255	0.257	-0.002	<<<
9	3/18/2009	13:29	13:49	0.256	0.257	-0.001	<<<
10							
11							
12							

Results:			
	Data Points (n)		9
	Arithmetic Mean Difference (d)		-0.004
	Standard Deviation (Sd)		0.002
	Confidence Coefficient (CC)		0.002
	Average RM Value (ARM)		0.242
	Average USS CEM Value (lb/MMBtu)		0.246
For Semiannual RATAs	Relative Accuracy (RA - 1)	passed	2.2% <= 10%
or	Relative Accuracy (RA - 4)	N/A	0.004 <= 0.02
For Annual RATAS	Relative Accuracy (RA - 1)	passed	2.2% <= 7.5%
or	Relative Accuracy (RA - 4)	N/A	0.004 <= 0.015
Bias Adjustment Factor	Is d <= Abs (CC)?	passed	-0.004 < 0.002
		BAF =	1.000

Notes:
<<< = Test run included in statistical analysis
RM = Reference Method
USS CEM = U.S. Steel Clairton Plant's Continuous Emission Monitor
CC = (t value) x (Sd / n^0.5) where t value = 2.306 for n = 9
RA - 1 = (Abs(d) + Abs(CC)) / ARM
RA - 4 = Average Absolute Arithmetic Difference
If d > Abs (CC) then BAF = 1 + Abs(d) / Average USS CEM Value
If d <= Abs (CC) then BAF = 1.000

Calculations according to U.S. EPA Performance Specification 2 and
PA DEP Continuous Source Monitoring Manual (Revision No. 6), Table II

U.S. STEEL CORPORATION - MON VALLEY COMPLEX
CLAIRTON PLANT - UTILITIES POWERHOUSE
CLAIRTON, PENNSYLVANIA

TABLE 2

BOILER NO. 2
NOx CEM PART 75 RATA RESULTS
MARCH 19, 2009

All Test Runs

Test Run No.	Test Date	Start Time (EDT)	Stop Time (EDT)	RM Test Run Avg. NOx (lb/MMBtu)	USS CEM Test Run Avg. NOx (lb/MMBtu)	Arithmetic Difference (lb/MMBtu)	
1	3/19/2009	9:02	9:22	0.234	0.242	-0.008	<<<
2	3/19/2009	9:34	9:54	0.241	0.248	-0.007	<<<
3	3/19/2009	10:07	10:27	0.239	0.245	-0.006	<<<
4	3/19/2009	10:40	11:00	0.238	0.245	-0.007	<<<
5	3/19/2009	11:15	11:35	0.257	0.263	-0.006	<<<
6	3/19/2009	11:48	12:08	0.253	0.259	-0.006	<<<
7	3/19/2009	12:20	12:40	0.245	0.251	-0.006	<<<
8	3/19/2009	12:53	13:13	0.235	0.241	-0.006	<<<
9	3/19/2009	13:25	13:45	0.251	0.257	-0.006	<<<
10							
11							
12							

Results:			
	Data Points (n)		9
	Arithmetic Mean Difference (d)		-0.006
	Standard Deviation (Sd)		0.001
	Confidence Coefficient (CC)		0.001
	Average RM Value (ARM)		0.244
	Average USS CEM Value (lb/MMBtu)		0.250
For Semiannual RATAs	Relative Accuracy (RA - 1)	passed	2.9% <= 10%
or	Relative Accuracy (RA - 4)	N/A	0.006 <= 0.02
For Annual RATAS	Relative Accuracy (RA - 1)	passed	2.9% <= 7.5%
or	Relative Accuracy (RA - 4)	N/A	0.006 <= 0.015
Bias Adjustment Factor	Is d <= Abs (CC)?	passed	-0.006 <= 0.001
		BAF =	1.000

Notes:
<<< = Test run included in statistical analysis
RM = Reference Method
USS CEM = U.S. Steel Clairton Plant's Continuous Emission Monitor
CC = (t value) x (Sd / n^0.5) where t value = 2.306 for n = 9
RA - 1 = (Abs(d) + Abs(CC)) / ARM
RA - 4 = Average Absolute Arithmetic Difference
If d > Abs (CC) then BAF = 1 + Abs(d) / Average USS CEM Value
If d <= Abs (CC) then BAF = 1.000

Calculations according to U.S. EPA Performance Specification 2 and
PA DEP Continuous Source Monitoring Manual (Revision No. 6), Table II